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APPLICATION NO.	FILING DATE	FIRST NAMED INVENTOR	ATTORNEY DOCKET NO.	CONFIRMATION NO.
10/736,846	12/17/2003	Yasutomo Kusunoki	725.1164	4828

21171 7590 07/12/2007

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EXAMINER	
KIM, EUNHEE	
ART UNIT	**PAPER NUMBER**
2123	

MAIL DATE	DELIVERY MODE
07/12/2007	PAPER

Please find below and/or attached an Office communication concerning this application or proceeding.

The time period for reply, if any, is set in the attached communication.

Office Action Summary	Application No.	Applicant(s)
	10/736,846	KUSUNOKI ET AL.
	Examiner	Art Unit
	Eunhee Kim	2123

-- The MAILING DATE of this communication appears on the cover sheet with the correspondence address --

Period for Reply

A SHORTENED STATUTORY PERIOD FOR REPLY IS SET TO EXPIRE 3 MONTH(S) OR THIRTY (30) DAYS, WHICHEVER IS LONGER, FROM THE MAILING DATE OF THIS COMMUNICATION.

- Extensions of time may be available under the provisions of 37 CFR 1.136(a). In no event, however, may a reply be timely filed after SIX (6) MONTHS from the mailing date of this communication.
- If NO period for reply is specified above, the maximum statutory period will apply and will expire SIX (6) MONTHS from the mailing date of this communication.
- Failure to reply within the set or extended period for reply will, by statute, cause the application to become ABANDONED (35 U.S.C. § 133). Any reply received by the Office later than three months after the mailing date of this communication, even if timely filed, may reduce any earned patent term adjustment. See 37 CFR 1.704(b).

Status

1)☒ Responsive to communication(s) filed on 16 April 2007.

2a)☒ This action is **FINAL**. 2b)☐ This action is non-final.

3)☐ Since this application is in condition for allowance except for formal matters, prosecution as to the merits is closed in accordance with the practice under *Ex parte Quayle*, 1935 C.D. 11, 453 O.G. 213.

Disposition of Claims

4)☒ Claim(s) 1,5,8,11,12 and 14-46 is/are pending in the application.

4a) Of the above claim(s) _____ is/are withdrawn from consideration.

5)☒ Claim(s) 24-46 is/are allowed.

6)☒ Claim(s) 1,5,8,11,12 and 14-26 is/are rejected.

7)☒ Claim(s) 12 and 24 is/are objected to.

8)☐ Claim(s) _____ are subject to restriction and/or election requirement.

Application Papers

9)☐ The specification is objected to by the Examiner.

10)☐ The drawing(s) filed on _____ is/are: a)☐ accepted or b)☐ objected to by the Examiner.

Applicant may not request that any objection to the drawing(s) be held in abeyance. See 37 CFR 1.85(a).

Replacement drawing sheet(s) including the correction is required if the drawing(s) is objected to. See 37 CFR 1.121(d).

11)☐ The oath or declaration is objected to by the Examiner. Note the attached Office Action or form PTO-152.

Priority under 35 U.S.C. § 119

12)☒ Acknowledgment is made of a claim for foreign priority under 35 U.S.C. § 119(a)-(d) or (f).

a)☒ All b)☐ Some * c)☐ None of:

1.☒ Certified copies of the priority documents have been received.

2.☐ Certified copies of the priority documents have been received in Application No. _____.

3.☐ Copies of the certified copies of the priority documents have been received in this National Stage application from the International Bureau (PCT Rule 17.2(a)).

* See the attached detailed Office action for a list of the certified copies not received.

Attachment(s)

1) ☐ Notice of References Cited (PTO-892)
2) ☐ Notice of Draftsperson's Patent Drawing Review (PTO-948)
3) ☐ Information Disclosure Statement(s) (PTO/SB/08) Paper No(s)/Mail Date _____.
4) ☐ Interview Summary (PTO-413) Paper No(s)/Mail Date. _____ .
5) ☐ Notice of Informal Patent Application
6) ☐ Other: _____.

DETAILED ACTION

1. The amendment filed 04/16/2007 has been received and considered. Claims 1, 5, 8, 11, 12 and 14-46 are presented for examination.

Response to Applicant's Remarks & Examiner's Withdrawals

2. Examiner respectfully withdraws Claim Rejections - 35 USC § 101 in view of the amendment and/or applicant's arguments.

3. Regarding claims 24-46: Examiner respectfully withdraws the Claim Rejection under 102 and 103(a) in view of the amendment and/or applicant's arguments with respect to claims 24-46.

Claim Objections

4. Claim 12 and 24 are objected to because of the following informalities:

As per claim 12, the limitation "the piston models" in line 7 would be better as "the piston model". Appropriate correction is required.

As per claim 24 the limitation "intake valve mode" in line 8 and in line 13 and "an exhaust valve mode" in line 15 would be better as "intake valve model" and "exhaust valve model".

DETAILED ACTION

1. The amendment filed 04/16/2007 has been received and considered. Claims 1, 5, 8, 11, 12 and 14-46 are presented for examination.

Response to Applicant's Remarks & Examiner's Withdrawals

2. Examiner respectfully withdraws Claim Rejections - 35 USC § 101 in view of the amendment and/or applicant's arguments.

3. Regarding claims 24-46: Examiner respectfully withdraws the Claim Rejection under 102 and 103(a) in view of the amendment and/or applicant's arguments with respect to claims 24-46.

Claim Objections

4. Claim 12 and 24 are objected to because of the following informalities:

As per claim 12, the limitation "the piston models" in line 7 would be better as "the piston model". Appropriate correction is required.

As per claim 24 the limitation "intake valve mode" in line 8 and in line 13 and "an exhaust valve model" in line 14-15 would be better as "intake valve mode" and "the exhaust valve model".

Claim Rejections - 35 USC § 103

5. The following is a quotation of 35 U.S.C. 103(a) which forms the basis for all obviousness rejections set forth in this Office action:

> (a) A patent may not be obtained though the invention is not identically disclosed or described as set forth in section 102 of this title, if the differences between the subject matter sought to be patented and the prior art are such that the subject matter as a whole would have been obvious at the time the invention was made to a person having ordinary skill in the art to which said subject matter pertains. Patentability shall not be negatived by the manner in which the invention was made.

6. The factual inquiries set forth in *Graham* v. *John Deere Co.*, 383 U.S. 1, 148 USPQ 459 (1966), that are applied for establishing a background for determining obviousness under 35 U.S.C. 103(a) are summarized as follows:

1. Determining the scope and contents of the prior art.
2. Ascertaining the differences between the prior art and the claims at issue.
3. Resolving the level of ordinary skill in the pertinent art.
4. Considering objective evidence present in the application indicating obviousness or nonobviousness.

7. This application currently names joint inventors. In considering patentability of the claims under 35 U.S.C. 103(a), the examiner presumes that the subject matter of the various claims was commonly owned at the time any inventions covered therein were made absent any evidence to the contrary. Applicant is advised of the obligation under 37 CFR 1.56 to point out the inventor and invention dates of each claim that was not commonly owned at the time a later invention was made in order for the examiner to consider the applicability of 35 U.S.C. 103(c) and potential 35 U.S.C. 102(e), (f) or (g) prior art under 35 U.S.C. 103(a).

8. Claims 1, 5, 8, 11, 12 and 14-23 are rejected under 35 U.S.C. 103(a) as being unpatentable over Barr et al. (The New Digital Engineering Design and Graphics Process), in view of Bracewell et al. (From Embodiment Generation to Virtual Prototyping).

As per claims 1, 14 and 15, Barr et al. teaches a piston design support apparatus and a computer readable medium encoded with a computer program for supporting design of a piston shape of an engine, said program begin executed by a computer to perform (Abstract, Fig. 8-10):

inputting specification defining a crown shape of piston and a shape and position of a value (Chapter II, Fig. 1, 8-10);

generating a two-dimensional image representing the piston and the valve, using the specification values (Chapter I-VI);

reading out a three-dimensional standard piston model and valve model from database (Chapter I-VI);

deforming the piston model and the valve model on the basis of the specification values (Chapter I-VI); and

determining whether or not the gap between the three-dimensional deformed piston model and the valve model is not less than a predetermined value (Chapter I-VI).

Barr et al. fails to teach calculating a gap between the piston and the valve in the generated two-dimensional image;

verifying whether or not the calculated gap between the piston and the valve in the generated two-dimensional is not less than a predetermined value; and

verifying that the gap is not less than the predetermined value.

Bracewell et al. teaches calculating a gap between the piston and the valve in the generated two-dimensional image (Chapter 3);

verifying whether or not the calculated gaps between the piston and the valve in the generated two-dimensional is not less than a predetermined value (Chapter 3); and

verifying that the gap is not less than the predetermined value (Chapter 3).

Barr et al. and Bracewell et al. are analogous art because they are both related to a solid modeling design system.

Therefore, it would have been obvious to one of ordinary skill in the art of at the time the invention was made to include the verification step of Bracewell et al., in the method of a digital engineering design with 3-D sold modeling system of Barr et al. because a verification step of verifying components value is a well known process in a method of a digital engineering design with 3-D sold modeling system. Bracewell et al. teaches advantages system that provides much greater ease of use, rigour and computational efficiency in design constraint management (Introduction).

As per claim 5, Barr et al. teaches inputting specification values defining a skirt shape of the piston and a shape and position of a connecting rod are input (Chapter I-VI);

generating a two-dimensional image representing the piston and the connecting-rod, using the specification values (Chapter I-VI);

reading out a three-dimensional standard piston model and valve model from database (Chapter I-VI);

deforming the piston model and the valve model on the basis of the specification values (Chapter I-VI); and

determining whether or not the gap between the three-dimensional deformed piston model and the connecting-rod model is not less than a predetermined value (Chapter I-VI).

Barr et al. fails to teach calculating a gap between the piston and the connecting-rod in the generated two-dimensional image ; and

verifying whether or not the calculated gap between the piston and the connecting-rod in the generated two-dimensional is not less than a predetermined value.

Bracewell et al. teaches calculating a gap between the piston and the connecting-rod in the generated two-dimensional image (Chapter 3); and

verifying whether or not the calculated gap between the piston and the connecting-rod in the generated two-dimensional is not less than a predetermined value (Chapter 3).

As per claim 8, Barr et al. teaches a computer readable medium encoded with a computer program for supporting design of a piston shape of an engine, said program being executed by a computer to perform (Abstract, Fig. 8-10):

inputting specification values associated defining a skirt shape of the piston and a shape and position of a counter-weight (Chapter I-VI);

generating a two-dimensional image representing the piston and the counter-weight, using the specification values (Chapter I-VI);

reading out a three-dimensional standard piston model and counter-weight from a database;

deforming the piston model and the counter-weight model on the basis of the specification values (Chapter I-VI); and

determining whether or not the gap between the three-dimensional deformed piston model and the counter-weight, model is not less than the predetermined value (Chapter I-VI).

Barr et al. fails to teach calculating a gap between the piston and the counter-weight in the generated two-dimensional image;

verifying whether or not the calculated gap between the piston and the counter-weight is not less than a predetermined value; and

verifying that the calculated gap is not less than the predetermined value.

Bracewell et al. teaches calculating a gap between the piston and the counter-weight in the generated two-dimensional image (Chapter 3);

verifying whether or not the calculated gap between the piston and the counter-weight is not less than a predetermined value (Chapter 3); and

verifying that the calculated gap is not less than the predetermined value (Chapter 3).

As per claim 11, Barr et al. fails to teach a step of reading out a verification formula from the database, substituting the specification values in the verification formula, and verifying whether or not the input specification values are appropriate.

Bracewell et al. teaches a step of reading out a verification formula from the database, substituting the specification values in the verification formula, and verifying whether or not the input specification values are appropriate (Chapter 3).

As per claim 12, Barr et al. teaches selecting one of types which are classified depending on shapes of a surface of the piston on a combustion chamber side after verification wherein the database stores the piston models in correspondence with the types, and the reading includes

reading out the three-dimensional standard piston model corresponding to the type selected in the selecting from the database (Chapter I-VI);

As per claims 16, 22 and 23, Barr et al. teaches wherein inputting, as the specification values, information associated with the piston, information associated with the valve, information associated with surfaces of a cylinder head that form a combustion chamber, and a target value of a capacity-related value which determines a capacity of the combustion chamber (Chapter I-VIII),

the verifying includes:

building step of building a recess model (Chapter I-VIII), which opposes the valve and has a gap with the valve to satisfy a predetermined condition, on a top portion of the piston model on the basis of the information associated with the piston and the information associated with the valve input in the inputting (Chapter I-VIII),

deforming includes:

setting a shape of a piston top portion so that the capacity of the combustion chamber becomes a target capacity determined from the target value of the capacity-related value (Chapter I-VIII), and

building a three-dimensional piston top portion model (Chapter I-VIII), on the basis of the recess model built in the recess model building step, and the information associated with the piston (Chapter I-VIII), the information associated with the surfaces which form the combustion chamber, and the target value of the capacity-related value input in the inputting (Chapter I-VIII), and

said program is executed by a computer to further perform:

building a three-dimensional valve model on the basis of the information associated with the valve input in the inputting (Chapter I-VIII).

Barr et al. fails to teach calculating a gap between a recess of the piston top portion model built in the piston top portion model building and the valve model built in the valve model building.

Bracewell et al. teaches calculating a gap between a recess of the piston top portion model built in the piston top portion model building step and the valve model built in the valve model building step (Chapter 3).

As per claim 17, Barr et al. teaches wherein the recess model building includes building the recess model on a flat piston top portion (Chapter I-VIII).

As per claim 18, Barr et al. teaches wherein said program makes the computer further execute:

rebuilding (Chapter I-VIII), when it is determined in the condition determination step that the gap does not satisfy the predetermined condition, the valve model by changing at least one of a valve thickness and a slope angle of a chamfer formed at a corner portion as an intersection of a recess opposing surface and side circumferential surface so that the gap satisfies the predetermined condition (Chapter I-VIII).

Barr et al. fails to teach determining whether or not the gap calculated in the gap

calculation step satisfies a predetermined condition of the gap between the recess and the valve in the recess model building.

Bracewell et al. teaches a condition determination step of determining whether or not the gap calculated in the gap calculation step satisfies a predetermined condition of the gap between the recess and the valve in the recess model building (Chapter 3).

As per claim 19, Barr et al. teaches wherein when the valve thickness of the valve model rebuilt in the valve rebuilding step is smaller than a prescribed value, said gap between the recess and the valve in the recess model building step is changed, and the recess model building step, the piston top portion model building step, the valve model building step, the gap calculation step, and the condition determination are executed again (Chapter I-VII).

As per claims 20 and 21, Barr et al. teaches inputting information associated with a position and shape of a piston ring groove to be formed on a side circumferential surface of the piston (Chapter I-VII), deforming includes:

building a three-dimensional piston model which comprises the recess and the piston ring groove independently of or to include the piston top portion model built in the piston top portion model building on the basis of the recess model built in the recess model building, and the information associated with the piston and the information associated with the position and shape of the piston ring groove are input in the inputting (Chapter I-VII).

Barr et al. fails to teach calculating a minimum value of a thickness between the recess and the piston ring groove in the piston ring on the basis of the piston model built in the piston

building (Claim 21), and is not less than a predetermined value.

Bracewell et al. teaches calculating a minimum value of a thickness between the recess and the piston ring groove in the piston ring on the basis of the piston model built in the piston building (Chapter 3) and (Claim 21) is not less than a predetermined value (Chapter 3).

Allowable Subject Matter

9. Claim 24-46 are allowed over the prior art.

Response to Arguments

10. Applicant's arguments filed 04/16/2007 have been fully considered but they are not persuasive.

<u>Applicant's arguments with respect to claims 1, 5, 8, 11, 12 and 14-23:</u>

Applicants have argued that neither Barr et al. or Bracewell et al. teaches two-dimensional verification prior to creating the three-dimensional model before reading out and deforming the three-dimensional before reading out and deforming the three-dimensional piston and valve models. The examiner disagrees because Bracewell et al. teaches two-dimensional verification prior to creating the three-dimensional model. For example constrain mating pin and hole diameters to be equal or ensure corresponds on two-dimensional verification step, so the piston recess is large enough for the ConRod eye (Chapter 3).

The examiner relies upon the teaching in Barr et al. to teach the limitation of generating a two-dimensional image representing the piston and the valve, using the specification values (Chapter I-VI) and reading out a three-dimensional standard piston model and valve model from database

(Chapter I-VI). Bracewell et al. is relied upon for a teaching of calculating a gap between the piston and the valve in the generated two-dimensional image (Chapter 3); and verifying whether or not the calculated gaps between the piston and the valve in the generated two-dimensional is not less than a predetermined value (Chapter 3). In response to applicant's arguments against the references individually, one cannot show nonobviousness by attacking references individually where the rejections are based on combinations of references. See *In re Keller*, 642 F.2d 413, 208 USPQ 871 (CCPA 1981); *In re Merck & Co.,* 800 F.2d 1091, 231 USPQ 375 (Fed. Cir. 1986).

Conclusion

11. **THIS ACTION IS MADE FINAL.** See MPEP § 706.07(a). Applicant is reminded of the extension of time policy as set forth in 37 CFR 1.136(a).

A shortened statutory period for reply to this final action is set to expire THREE MONTHS from the mailing date of this action. In the event a first reply is filed within TWO MONTHS of the mailing date of this final action and the advisory action is not mailed until after the end of the THREE-MONTH shortened statutory period, then the shortened statutory period will expire on the date the advisory action is mailed, and any extension fee pursuant to 37 CFR 1.136(a) will be calculated from the mailing date of the advisory action. In no event, however, will the statutory period for reply expire later than SIX MONTHS from the date of this final action.

12. Any inquiry concerning this communication or earlier communications from the examiner should be directed to Eunhee Kim whose telephone number is 571-272-2164. The examiner can normally be reached on 8:30am-5:00pm Monday to Friday.

If attempts to reach the examiner by telephone are unsuccessful, the examiner's supervisor, Paul Rodriguez can be reached on 571-272-3753. The fax phone number for the organization where this application or proceeding is assigned is 571-273-8300.

Information regarding the status of an application may be obtained from the Patent Application Information Retrieval (PAIR) system. Status information for published applications may be obtained from either Private PAIR or Public PAIR. Status information for unpublished applications is available through Private PAIR only. For more information about the PAIR system, see http://pair-direct.uspto.gov. Should you have questions on access to the Private PAIR system, contact the Electronic Business Center (EBC) at 866-217-9197 (toll-free). If you would like assistance from a USPTO Customer Service Representative or access to the automated information system, call 800-786-9199 (IN USA OR CANADA) or 571-272-1000.

EK

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